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Management of Migration Alternatives

Comparative Analysis of Management of Migration Alternatives

A summary of the individual evaluation of the six management of migration alternatives is presented in Table 26. The comparative analysis of the six alternatives is presented below for each of the NCP evaluation criteria, except the State and community acceptance.

Protection of Human Health and the Environment. Alternatives MOM-3 (Air stripping with GAC Adsorption), MOM-4 (GAC Adsorption), MOM-5 (UV/Oxidation with GAC Adsorption), and MOM-6 (Extraction and Discharge to POTW), in conjunction with the implementation of a source control alternative, would reduce the contamination in the ground water to below risk- and health-based ARARs in a reasonable time frame. Each of these four alternatives would eliminate unacceptable risk related to VOCs in the contaminated overburden in approximately 10 years by extracting and treating the contaminated ground water. Time frames cannot be estimated for TCB and PCBs; however they are expected to take longer, and up to 100 years, given that these two contaminants are not easily moved through the groundwater during extraction. The ability to meet the time frames presented in these alternatives is dependent on the amount of contamination remaining in the unsaturated and saturated zones at the completion of the source control action, as well as the extent of the contamination within the bedrock.

Upon achieving the remedial action objectives for Alternatives MOM-3, MOM-4, MOM-5, and MOM-6, the risk for the ingestion of and dermal contact with ground water would be reduced.

While the interim cleanup levels established for these alternatives are consistent with ARARs or suitable TBC criteria for groundwater, a cumulative risk that could be posed by these compounds may exceed EPA's goals for remedial action. At the time that the interim ground water cleanup levels, newly promulgated ARARs, and modified ARARs that call into question the protectiveness of the selected alternative have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment would be performed on the residual ground water contamination to determine whether the remedial action is protective.

By reducing the risk in the groundwater through any of these four alternatives, the discharge of contaminants to the surface water and sediments of the Souhegan River would also be reduced.

Alternatives MOM-3, MOM-4, MOM-5, and MOM-6 have the potential to impact the wetlands along the river. Predictive modeling conducted using the computer model described in Section 3.3.2 indicated that the extraction system would extract river water, but the effect on the wetlands bordering the river should be negligible.

The Limited Action/ Institutional Controls alternative, MOM-2, would be protective of human health because it requires the implementation of institutional controls in the form of restrictions on the use of the contaminated groundwater, as drinking water, until drinking water standards have been met. The No Action alternative, MOM-1, would not be protective of human health and the environment because it does not prevent the future ingestion of the contaminated groundwater. Since neither restrictions would be placed on the use of the groundwater as a drinking water supply until drinking standards have been met, nor any treatment or containment technologies implemented as part of the No Action alternative, the human health risks from the ingestion of the contaminated groundwater would not be mitigated.

Both Alternatives MOM-1 (No Action) and MOM-2 (Limited Action/Institutional Controls) would not provide any protection to the environment and would not return the aquifer to its beneficial use in a reasonable time frame.

The No Action alternative, MOM-1 would not include the use of restrictions to prevent exposure to the groundwater or the use of treatment to reduce the toxicity, mobility or volume of the contaminated groundwater at the Site; and would allow the contaminated groundwater to continue to migrate off-site and release contaminants, over time, to the Souhegan River surface waters and sediments. Contaminant concentrations in the groundwater currently exceed drinking water standards. With both MOM-1 and MOM-2, the contamination in the groundwater would be reduced over a very long period of time due to natural attenuation process such as dispersion, dilution, sorption, volatilization and both biological and abiotic degradation of the volatile contaminants.

In the absence of active remediation of the contaminated groundwater, the VOC and PCB concentrations in the overburden, are expected to persist in excess of the drinking water standards for approximately 25 years and greater than 100 years, respectively. Contaminant concentrations within the bedrock would be expected to remain in excess of the drinking water standards for an even greater time frame, depending on the full extent of contamination within the bedrock system. Depending on the source control action taken at the Site, contaminated soils could act as a source of continuous groundwater contamination through leachate generation and contaminant migration.

Compliance with ARARs. Alternatives MOM-3, MOM-4, MOM-5, and MOM-6, in conjunction with the implementation of an appropriate source control alternative, would meet the chemical-specific ARARs in the ground water within a reasonable time frame. Each of these alternatives would meet the ground water cleanup levels for volatile and semivolatile contaminants within 10 years.

By meeting the chemical-specific ARARs in the ground water, any of these four alternatives would reduce the discharge of contaminants to the surface water and sediments to below the ground water cleanup levels for these two media, and the elimination of contaminant discharge to the environment would reduce the contaminant exposure of ecological receptors to acceptable risk levels.

The ability to meet the time frames presented in these alternatives is dependent on the amount of contamination remaining in the unsaturated and saturated zones at the completion of the source control action, as well as the extent of contamination within the bedrock. Assuming there is no unacceptable, residual contamination in the unsaturated zone, MOM-3, MOM-4, MOM-5, and MOM-6 would eliminate unacceptable risks due to VOCs in the overburden groundwater within 10 years, but could take much longer(up to 100 years) to reach acceptable risks due to PCB and TCB contamination in the overburden and bedrock.

Alternatives MOM-1 (No Action) and MOM-2 (Limited Action/Institutional Controls) would each take approximately 25 and at least 100 years to meet the chemical-specific ARARs for VOCs and PCBs, respectively, in the ground water within the overburden, and possibly longer for the bedrock. Again, these time frames were estimated assuming that the source of the contaminants had been removed.

Alternatives MOM-1 and MOM-2 do not have any action-specific ARARs because no action would be taken under these alternatives. Alternatives MOM-3, MOM-4, MOM-5, and MOM-6 would all meet the action-specific ARARs, including:

- State air emission regulations on the air discharge from the air stripper and the UV/oxidation system if ozone is used as the oxidant

- State air stripper regulations on the operation and control of the air stripper

- State hazardous waste regulations on the management and disposal of spent granular activated carbon ("GAC ") and other treatment residuals

- State and federal safe drinking water and Clean Water Act regulations on the discharge of the treated ground water

- State and federal water pollution control regulations on the discharge of water to a POTW

- State underground injection regulation on the reinjection of the ground water into the aquifer.

Long-Term Effectiveness and Permanence. Alternatives MOM-3, MOM-4, MOM-5, and MOM-6 would reduce the risk due to VOCs in the overburden plume to acceptable limits within 10 years by extracting and treating the ground water. Because the PCBs and TCB are hydrophobic and adhere strongly to soils, and therefore are less mobile in the groundwater, it will take much longer for these contaminants to reach acceptable limits, and possibly up to 100 years.

While these ground water cleanup levels are consistent with ARARs or suitable TBC criteria for ground water, future federal or state regulations may modify the ARARs. Therefore, at the time that these ground water cleanup levels, newly promulgated ARARs, and modified ARARs that call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment would be performed on the residual ground water contamination to determine whether the remedial action is protective.

The ability to meet the time frames presented in these alternatives is dependent on the amount of contamination remaining in the unsaturated and saturated zones at the completion of the source control action, which can continue to provide a source for the contamination in the ground water, as well as the nature of the extent of the contamination within the bedrock. Assuming there is no residual contamination in the unsaturated zone or bedrock, MOM-3, MOM-4, MOM-5, and MOM-6 would eliminate unacceptable risks within 10 years.

Alternatives MOM-1 and MOM-2 would each take at least 25 and greater than 100 years to reduce the VOC and PCB contamination, respectively, in the ground water within the overburden, to within the NCP risk range. The presence of contamination in the Fletcher's Paint Site bedrock ground water would pose an even longer long-term residual risk, depending on the extent of the contamination within the bedrock.

Alternatives MOM-3, MOM-4, and MOM-5 would each produce similar quantities and types of treatment residuals that would have to treated and disposed of off-site. All residuals that would be generated during the remediation of the ground water would be disposed of in a manner to eliminate unacceptable risks. If metals removal is required, the metal hydroxide sludges from the metal precipitation unit would be disposed of in a hazardous waste landfill, and the spent GAC would be regenerated by the vendor, destroying adsorbed contaminants. Spent filters and any free product removed from the equalization tank would be shipped off Site for treatment and disposal. Alternative MOM-6 would produce only minimal residuals. Alternative MOM-6 would result in the generation of spent filters and the collection of any free product removed from the equalization tank. Each of these residuals would be shipped off-site for treatment and disposal. Alternatives MOM-1 and MOM-2 would not produce any residuals because no treatment would be performed.

The active management of migration alternatives, MOM-3, MOM-4, MOM-5, and MOM-6 would be operated until the ground water met the ground water cleanup levels, and the contaminants would be either destroyed on-Site in the UV/oxidation system or off-site when the GAC is regenerated or the extracted ground water is sent to the POTW; therefore, no long-term controls would be necessary. All of the technologies that would be used in these alternatives are considered reliable.

All six management of migration alternatives would require five-year reviews to evaluate whether the alternative is protective of public health and the environment. The five-year reviews would be initiated five years after the start of the remedial action and would continue until no contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure.

Reduction of Toxicity, Mobility, or Volume through Treatment. In alternative MOM-3, the contamination would be treated using an air stripper to volatilize the contaminants from the ground water. The air stripper initially transfers the contamination from the ground water to the air and then from the air to the vapor phase GAC. The effluent from the stripper would be polished with an aqueous phase GAC system to adsorb the remaining "unstrippable" contaminants. Air stripping is a well proven technology and, based on the results from Sites with similar contamination, would remove approximately 90 percent of the VOCs from the ground water. The remaining contaminants would be removed by the liquid phase GAC system. The contaminants adsorbed to the vapor and aqueous phase carbon units would be irreversibly destroyed during the off-site carbon regeneration. This treatment system would, therefore reduce the volume, toxicity, and mobility of the contaminants.

In alternative MOM-4, the contamination would be treated using an aqueous phase GAC system. Greater than 99 percent of the contaminants would be adsorbed from the extracted ground water prior to discharge of the treated effluent. The contaminants adsorbed to the aqueous phase carbon units would be irreversibly destroyed during the off-site carbon regeneration. This treatment system would therefore, reduce the volume, toxicity, and mobility of the contaminants.

In alternative MOM-5, the UV/Oxidation system would remove approximately 99 percent of the contamination from the extracted ground water, based on the previous studies conducted by Arthur D. Little and discussions with a UV/Oxidation system vendor. The UV/Oxidation system would irreversibly destroy the contaminants directly by oxidizing the organics to carbon dioxide, water, and hydrochloric acid. The remaining contaminants would be treated using the liquid phase GAC system and would be irreversibly destroyed during the off-site carbon regeneration. This treatment system would reduce the volume, toxicity, and mobility of the contaminants.

In alternative MOM-6, the discharge of the extracted ground water to the Milford POTW would result in the destruction of greater than 95 percent of the contamination. Those metals and refractory organics would either be collected in the sludge or discharged with the POTW effluent. The majority of the organics contained in the sludge would be irreversibly destroyed when the sludge was composted. Any metals captured in the sludge would not be removed, but would remain in the sludge. This treatment system would reduce the volume, toxicity, and mobility of the contaminants. Alternatives MOM-1 and MOM-2 would not involve the reduction of the volume, toxicity, and mobility of the contaminants through treatment.

Alternatives MOM-3, MOM-4, and MOM-5 would produce varying quantities but similar types of treatment residuals. The spent GAC would be generated by Alternatives MOM-3, MOM-4, and MOM-5 at rates of approximately 5.5, 18, and 0.6 tons/year, respectively, and would be recovered through off-site regeneration. Alternative MOM-6 would result in the generation of minimal residuals, composed of any NAPLs collected in the equalization vessel and spent filters. Each of the four active management of migration alternatives would generate similar quantities of liquids and solids in the equalization vessel, as well as spent filters, as all four would employ identical equalization and filtering systems. An estimated 50 pounds of solids would be collected each year in the equalization tank that would have to be treated off Site. Spent filters would also require off-site treatment or disposal. If metals removal is required, the metal precipitation system would generate metal hydroxide sludges at a rate of approximately 73 tons/year for each of these four alternatives. These sludges would be disposed of off-site as a hazardous waste. Alternatives MOM-1 and MOM-2 would not produce any residuals because no treatment would be performed.

Short-Term Effectiveness. The operations of the equipment for Alternatives MOM-3, MOM-4, and MOM-5 are not expected to increase the risk to the community because the air emissions from the air stripper and the UV/Oxidation system would be treated by GAC prior to their release to the environment. The risks to the workers from using the acids, bases, and the hydrogen peroxide associated with the air stripper, metals precipitation, and UV/Oxidation treatment would be minimized through the use of engineering controls and personal protective equipment. The effluent for each of these three alternatives would be treated with aqueous phase GAC adsorbers to remove contaminants prior to discharge. Alternative MOM-6 is not expected to pose any short term risks to the community, as the only treatment conducted on Site is the filtering of the extracted ground water.

Alternatives MOM-3, MOM-4, MOM-5, and MOM-6 would achieve remedial action objectives in a reasonable time frame. Each of these alternatives would meet the VOC groundwater cleanup levels in the plume within approximately 10 years by extracting and treating the ground water (MOM-3, MOM-4, and MOM-5), or by extracting the ground water and discharging it for treatment (MOM-6). While the time to reach cleanup levels in the overburden cannot be estimated for TCB and PCBs, the time frame is expected to be much greater, and could be up to 100 years, due to the hydrophobic nature of these contaminants and lower impact that a groundwater extraction system would have on these particular contaminants versus the VOC contaminants. The ability to reach the interim cleanup levels in the overburden, is dependent on the amount of contamination that remains in the unsaturated zone at the end of the source control action and the extent of the contamination within the bedrock. Further bedrock studies will be necessary, once the source control action is complete to determine the ability of and the estimated time frame for the groundwater within the bedrock to reach the interim cleanup levels. It is estimated, however, that the time to meet cleanup levels in the bedrock will be much longer than the time frame estimated for the overburden. Assuming there is no residual contamination in the unsaturated zone or bedrock, Alternatives MOM-3, MOM-4, MOM-5, and MOM-6 would meet the ground water cleanup levels for VOCs within 10 years in the overburden.

By reducing the risk in the ground water in each of these four alternatives, the discharge of contaminants to the surface water and sediments would be reduced to below the cleanup levels for these two media, and the elimination of contaminant discharge to the environment would reduce the contaminant exposure of ecological receptors to acceptable risk levels. Alternatives MOM-1 and MOM-2 would not increase risk to the residents, workers, or the environment; however, neither alternative would meet the VOC and PCB ground water cleanup levels within the overburden for approximately 25 and at least 100 years, respectively, and even longer within the bedrock, depending on the extent of the contamination within the bedrock.

Implementation. The construction and operation of the air stripper, GAC adsorption, and UV/oxidation systems for MOM-3, MOM-4, and MOM-5, respectively, can be easily implemented and are technically capable of treating the contaminants in the ground water. However, the UV/Oxidation system used in MOM-5 is innovative; if the system cannot meet the ground water cleanup levels, then either MOM-3 or MOM-4 can be used in its place. Alternatives MOM-3, MOM-4, and MOM-5 can each be expanded if additional ground water needs to be treated or the concentration of contamination is greater than expected. No special equipment, materials, or specialists would be required for the implementation of any of these three alternatives. Alternative MOM-6 can also be implemented, technically, and could treat more than double the anticipated flow rate, as the POTW currently treating much less than its rated capacity.

Alternatives MOM-2, MOM-3, MOM-4, MOM-5, and MOM-6 would require state and local coordination for the implementation of legal restrictions on the use of ground water at the Site. Alternatives MOM-3, MOM-4, and MOM-5 would also require state and local coordination for the discharge of treated air and ground water to the environment.

Cost

Table : Comparative Cost of Management of Migration Alternatives

Cost	Alternative MOM-1 No Action	Alternative MOM-2 Limited Action/ Institutional Controls	Alternative MOM-3 Air Strip & GAC	Alternative MOM-4 GAC Adsorption	Alternative MOM-5 UV/Ox & GAC	Alternative MOM-6 Discharge to POTW
Capital Cost	$0	$0	$0.49 million	$0.37 million	$0.62 million	$0.62 million
Annual O&M Cost	$4,000	$0.20 million	$0.45 million	$0.48 million	$0.44 million	$0.31 million
NPV	$48,000 (a)	$2.31 million (a)	$3.77 million (b)	$3.84 million (b)	$3.82 million (b)	$2.85 million (b)

Notes:

(a) Total NPV (1996$) estimated over 25 years at a 7% interest rate.
(b) Total NPV (1996$) estimated over 10 years at a 7% interest rate.

X. THE SELECTED REMEDY

The selected remedy is a comprehensive remedy which utilizes source control and management of migration components to address the principal Site risks for this operable unit. Highly contaminated soils at the Elm and Mill Street Sites which pose the greatest risk to human health based on the anticipated future uses of the Site would be excavated, treated on-site by thermal desorption, and replaced. The concentrations of the contaminants in the remaining contaminated soils would be protective of the environment and prevent the future long-term spread of the contamination to the groundwater through leaching. Management of migration will be accomplished over time through institutional controls and monitored natural attenuation.

The selected remedy is a combination of the SC-6, thermal desorption and MOM-2, monitored natural attenuation alternatives presented in the FS. Several modifications to the SC-6, thermal desorption alternative was presented in the Proposed Plan. These modifications included an elevation of the Elm Street subsurface soil cleanup standard from 1 mg/kg to 10 mg/kg PCB and the selection of a RCRA Subtitle D cap at the Elm Street Site as the long-term management option for the contaminated soils left in place. Based on public comments received on the Proposed Plan, the remedy was again modified as presented below. For a more complete description of these changes see the Documentation of Significant Changes, Section XII of the ROD.

A. Interim Ground Water Cleanup Levels

Interim cleanup levels have been established in ground water for all contaminants of concern identified in the Baseline Risk Assessment found to pose an unacceptable risk to either public health or the environment. Interim cleanup levels have been set based on the ARARs (e.g., Drinking Water Maximum Contaminant Levels (MCLs) , and NH Ambient Groundwater Quality Standards (AGQS) as available, or other suitable criteria described below. Periodic assessments of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. At the time that Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by ingestion of the groundwater. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective or is modified. These protective residual levels shall constitute the final cleanup levels for this ROD and shall be considered performance standards for this remedial action.

Because the aquifer under the Site is a Class IIB aquifer, which is a potential source of drinking water, MCLs established under the Safe Drinking Water Act and the NH Ambient Groundwater Quality Standards (AGQS) are ARARs. The New Hampshire Department of Environmental Services completed a Beneficial Use and Value Determination on the Milford-Souhegan Aquifer in which the Fletcher's Paint Site is located. This determination is attached as Appendix D. NHDES determined that the groundwater beneath the Site was of medium use and value to the community and the State of New Hampshire. This finding indicates that the groundwater beneath the Site has "medium" value as a future drinking water supply, having been a drinking water supply in the past, and therefore drinking water standards, consistent with the use and value determination, shall be attained in the groundwater at the Site.

Interim Cleanup Levels for known, probable, and possible carcinogenic compounds (Classes A, B, and C) have been established to protect against potential carcinogenic effects and to conform with ARARs. Because the MCLGs for Class A & B compounds are set at zero and are thus not suitable for use as interim cleanup levels, MCLs have been selected as the interim cleanup levels for these Classes of compounds.

Interim cleanup levels for Class D and E compounds (not classified, and no evidence of carcinogenicity) have been established to protect against potential non-carcinogenic effects and to conform with ARARs. MCLs have been selected as the interim cleanup levels for these Classes of compounds.

In the absence of a non-zero MCLG, an MCL, a proposed non-zero MCLG, proposed MCL, State standard, or other suitable criteria to be considered (i.e., health advisory, state guideline) an interim cleanup level was derived for each compound having carcinogenic potential (Classes A, B, and C compounds) based on a 10^{-6} excess cancer risk level per compound considering the future ingestion of the groundwater. In the absence of the above standards and criteria, interim cleanup levels for all other compounds (Classes D and E) were established based on a level that represent an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1) considering the future ingestion of the groundwater.

The table below summarizes the Interim Cleanup Levels for carcinogenic and non-carcinogenic contaminants of concern identified in ground water.

Interim Ground Water Cleanup Levels

Carcinogenic Contaminant of Concern (Class)	Interim Cleanup Levels (ug/L)	Basis	Level of Risk
Volatiles:			
Benzene (A)	5.0	MCL	1.7×10^{-6}
1,2-Dichloroethane (B)	5.0	MCL	5.3×10^{-6}
Trichloroethylene (B)	5.0	MCL	6.5×10^{-7}
Pesticides/PCBs:			
PCB (B)	0.5	MCL	1.2×10^{-5}
	Total Carcinogenic Risk		$\mathbf{2 \times 10^{-5}}$

Non-Carcinogenic Contaminant of Concern (Class)	Interim Cleanup Levels (ug/L)	Basis	Target Endpoint of Toxicity	Hazard Quotient
Volatiles:				
Ethylbenzene(D)	700	MCL	liver and kidney toxicity	0.2
Toluene (D)	1,000	MCL	liver and kidney weight changes	0.1
			Total HI for liver and kidney	**0.3**
Semivolatiles:				
1,2,4-Trichlorobenzene (D)	70	MCL	reduced body weight gain	0.2
			Total HI Body weight loss	**0.2**
PCBs	0.5	MCL	immune system	0.7
			Total HI Immune System	**0.7**
Metals				
Manganese	180	Risk-Based	central nervous system (CNS) effects	1
			Total HI CNS Effects	**1**

All Interim Groundwater Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy and protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at the points of compliance. At this Site, the Interim Cleanup Levels must be attained throughout the contaminated groundwater plume, which extends from the Mill Street Site to the Souhegan River. The exact boundary of such contaminated plume will be defined during remedial design by the establishment of the Groundwater Management Zone, consistent with NH's Groundwater Management Policy. EPA has estimated that the Interim Cleanup Levels for the VOC contamination in the overburden will be obtained within 20 to 25 years after completion of an active source control component. It is expected that the PCB contamination would persist for greater than 100 years following an active source control component. The fractured, shallow bedrock zone will require further characterization and monitoring of the migration of the contaminants into and through the bedrock fractures, to determine when or if the Interim Cleanup Levels will be attained within the bedrock within a reasonable time frame. However, based on the current understanding of the groundwater contamination within the bedrock, the restoration time frame is expected to be greater than the 20 to 25 years estimated for the overburden for the VOCs and remain greater than 100 years for the PCB contamination.

B. Soil Cleanup Levels

Soil cleanup levels have been established to address two different exposure pathways: 1) dermal contact and incidental ingestion of surface and subsurface soils, and 2) future ingestion of contaminated groundwater.

<u>Soil cleanup levels based on exposures through dermal contact and incidental ingestion of surface and subsurface soils</u>

Cleanup levels for known and suspect carcinogens (Classes A, B, and C compounds) have been set at a 10^{-6} excess cancer risk level based on exposures via dermal contact and incidental ingestion of surface and subsurface soils at the Site. Cleanup levels for PCBs are based on EPA's guidance entitled *Guidance Actions for Superfund Sites with PCB Contamination* (PCB Guidance, EPA 1990)(TSCA Spill Policy). Cleanup levels for compounds in soils having non-carcinogenic effects (Classes D and E compounds) were derived for the same exposure pathway(s) and correspond to a level that represents an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1).

Cleanup levels, based on dermal contact and incidental ingestion, were developed for two depths of soil: 0 to 1 foot across the Site; and from 1 to 10 feet at the Elm Street Site within a utility corridor(s).

Surface soils 0 to 1 foot. The cleanup level for surface soils at the Elm Street and Mill Street Sites is protective for an adult or child resident trespassing on the property in the future, consistent with the Town of Milford's future use expectations for the Site. The cleanup level for PCBs has been set at 1 mg/kg of PCBs. Based on the expected future uses of the Elm and Mill Street Site, this level corresponds to a 3.0×10^{-6} excess cancer risk level. For noncarcinogenic risks, the Hazard Quotient for 1 mg/kg PCB is 0.4. (Appendix E contains the calculations for the carcinogenic risk and Hazard Quotient for PCBs). The Hazard Quotient for arsenic at a cleanup level of 0.9 mg/kg is 0.02.

Subsurface soils 1 to 10 feet within the utility corridor(s) at the Elm Street Site. Under an unrestricted recreational use of the property, adults and children could receive unacceptable risks from exposure to subsurface soils brought to the surface by future excavations. The Town of Milford has indicated that future excavation of the Elm Street Site would be restricted to defined utility corridor(s). This will prevent exposures to the adult and child recreational user to the undisturbed contaminated subsurface soils. The 10 foot depth corresponds to a depth which is considered accessible in the performance of utility placement and maintenance. The cleanup level for subsurface soil within the utility corridor(s) at the Elm Street Site, is 25 mg/kg PCB. The cancer risk for a utility worker who might be exposed to 25 mg/kg PCB in the utility corridor(s) on an infrequent basis is 4.6×10^{-7}. For non-carcinogenic risks, the Hazard Quotient at 25 mg/kg PCB for the utility worker, is 0.3. (See Appendix E of this ROD for the calculations of the utility worker cancer and Hazard Quotient).

The table below summarizes the cleanup levels for carcinogenic and non-carcinogenic contaminants of concern in soils.

Interim Soil Cleanup Levels For the Protection of Human Health from Dermal Contact and Incidental Ingestion

Surface Soils - 0 to 1 Foot at Elm and Mill Street

Compound	Interim Cleanup Level (mg/kg)	Basis	Risk at Cleanup Level (1)
Benzo [a] anthracene	2.1	Risk-Based (1)	1.0×10^{-6}
Benzo [a] pyrene	0.2	Risk-Based (1)	1.2×10^{-6}
Benzo [a] fluoranthene	2.0	Risk-Based (1)	1.4×10^{-6}
PCB	1.0	PCB Spill Policy (2)	3.0×10^{-6}
Arsenic	0.9	Risk-Based (1)	1.0×10^{-6}
		Total Risk	**7.6×10^{-6}**

Subsurface Soils - 1 to 10 Feet at Elm Street Site Utility Corridor (s)

Compound	Interim Cleanup Level (mg/kg)	Basis	Risk at Cleanup Level (1)
PCB	25	PCB Spill Policy (2)	4.6×10^{-7}
		Total Risk	**4.6×10^{-7}**

(1) Risk based on incidental ingestion and dermal contact with soil. See the 1994 and 1996, amended Human Health Baseline Risk Assessments for exposure parameters and equations.
(2) PCB Spill Policy (40 CFR 761.60(d)) and EPA *Guidance on Remedial Actions for Superfund Sites with PCB Contamination* (EPA, 1990)

Soil cleanup levels for the protection of groundwater from potential soil leachate

In addition to the cleanup levels established for protection of human health from exposure to the surface and subsurface soils, consistent with the anticipated future uses of the Site, available data also suggest that the contaminated soils are also a source of release of PCBs to the groundwater. This phenomenon may result in an unacceptable risk to those who ingest the contaminated groundwater in the future. Therefore, cleanup levels were also established for Site soils, to protect the aquifer from potential soil leachate. The Guidance for Remedial Actions for Superfund Sites with PCB Contamination (EPA, 1990) was considered in addressing the contaminated soils that may be contained and managed in place over the long term.

Subsurface soils in all areas below 1 foot at the Elm and Mill Street Sites, except for the area to be defined as the utility corridor at the Elm Street Site: Soils below 1 foot at the Elm and Mill Street Sites, with the exception of the area to be designated as the utility corridor at the Elm Street Site, are not expected to pose a threat to human health through direct contact given their depth or location, based on anticipated future uses of the properties. However, contaminants at these depths could leach into the ground water and pose a threat to human health through ingestion of ground water. The remedial action objective for these soils is to prevent the leaching of contaminants from the soil to the ground water that will result in the concentration of PCBs in the ground water in excess of health and risk-based ARARs.

The Elm Street and Mill Street leachate modeling efforts reflect the apparent fate and transport issues affecting each portion of the Site differently. At the Elm Street Site, PCB transport through the subsurface is low, resulting in groundwater contaminant concentrations just above the drinking water standards. At the Mill Street Site, PCB concentrations are very high and exceed what one would expect given the fate and transport mechanisms for PCBs in soils. For soils greater than 1 foot at both the Elm Street and Mill Street Site, PCB migration from the unsaturated soil to the water table was modeled to determine whether current PCB soil concentrations would result in a ground water exceedance of the MCL for PCBs in ground water (0.5 ug/L).

Elm Street

The results of a previous EPA modeling effort (EPA PCB Guidance, 1990) were used to evaluate a PCB concentration that could remain at the Elm Street Site and not impact the groundwater in the future above the Interim Cleanup Level for PCBs. The results of this modeling indicate that a threat to the ground water currently exists from the PCB contamination at the Elm Street Site. The model indicates that the PCBs that are present in the unsaturated soils below 1 foot at the Elm Street Site will migrate to the ground water and result in an exceedance of the MCL for PCBs, set at 0.5 ug/l PCB. If left unaddressed, this process could continue for several hundred years because PCB migration is extremely slow. Therefore a cleanup level of 100 mg/kg PCB which could remain in the soils at the Elm Street Site, with only a soil cover, was set. This concentration will not result in an exceedance of the groundwater MCL for PCBs in the future.

Mill Street
A separate modeling analysis was conducted (located in Appendix E of the FS) for the Mill Street Site due to the high concentrations of PCBs already present in the ground water in this area, and as a result of finding other contaminants present that are known to increase the solubility of the PCBs. This analysis suggested that the PCB migration rate at Mill Street could be higher as a result of interaction between the PCBs and the other contaminants found at the Mill Street Site. The modeling indicated that the PCBs that are currently present in the unsaturated soils below 1 foot at Mill Street will migrate to the ground water and cause an exceedance of the MCL for PCBs in the ground water beneath the Site.

Another factor at the Mill Street Site is the presence of other paint related materials that appear to form a flocculent material (precipitate)within the well screen of monitoring well, MW-07A. The PCB concentration associated with this flocculent material is 1,780 ug/l PCB (Arochlor 1242). No separate phase DNAPL was observed during any purging of the well or sampling of this material. A 46 ug/l PCB concentration found in the top portion of the same groundwater sample may have been influenced by particulates that had not settled out, and therefore may not represent the groundwater conditions around MW-07A.

The SESOIL model for leaching, and the AT123D model for down gradient groundwater concentrations were used to determine a soil concentration that will result in groundwater concentrations at or below the Interim Cleanup Levels. SESOIL is a mathematical model designed for long-term hydrologic, sediment, and pollutant fate simulations. It can describe water transport, sediment transport, pollutant transport and transformation; soil quality; pollutant migration to groundwater; and other processes. Simulations are performed using a specified soil column extending between the ground surface and the lower part of the unsaturated soil zone. These models were used to estimate residual soil levels that are not expected to impair future groundwater quality. The Interim Cleanup Level for PCBs in groundwater was used as input into the leaching model. If the predicted protective soil level was not capable of being detected with good precision and accuracy, then the practical quantification limit was selected as the cleanup level for soils.

Low flow data collected during Phase 1B of the RI indicated that dissolved and mobile PCB contamination was present in the groundwater at both monitoring wells located within the known source area at the Mill Street Site (MW-07A and MW-21C). Sampling conducted by GE in 1995 also confirmed dissolved and mobile PCB contamination within the overburden and bedrock at the Mill Street Site.

Because of the potential for the enhanced solubility and migration of PCBs as a result of other paint related materials found only at the Mill Street Site, EPA used a conservative approach to modeling the concentration of PCBs that can remain in the saturated and unsaturated soils and not result in an exceedance of groundwater Interim Cleanup Levels. The results of the modeling indicated that 1 mg/kg PCB could remain in the soils at the Mill Street Site, with only a soil cover, and not result in an exceedance of the groundwater MCL for PCBs in the future. Recognizing EPA's conservative approach, soil column testing can be conducted during design to determine a site-dependent PCB concentration that could remain in the soils at the Mill Street Site and not result in an exceedance of the groundwater MCL for PCBs in the future. If changes are made to the Mill Street Site subsurface soil concentration in the future, the Draper Energy subsurface soil concentrations, currently set at 1 mg/kg PCB, would also have to be revisited to ensure that subsurface soils at the property would remain protective for future adult and child exposures. The determination of a subsurface soil concentration at the Mill Street Site, as well as any revisited cleanup level at the Draper Energy property, other than the 1 mg/kg PCB set in this ROD, will be in the sole discretion of the EPA.

The long-term management controls, including appropriate engineering and institutional controls, developed for the Elm and Mill Street portion of the Sites are presented in detail in Section 4.0 of the FS, and described in SC-4 under the detailed analysis of the source control alternatives. While all of the long-term management options are considered protective of the groundwater, EPA selected option 3, soil excavation and placement of a soil cover for both the Elm Street and Mill Street Sites.

In summation, the soil cleanup levels for groundwater leaching purposes and long-term management actions for the Elm and Mill Street Sites are summarized as follows:

Elm Street - Excavate all subsurface soils to a concentration of 100 mg/kg PCB or to a concentration at which leaching models and/or column testing show that infiltration through the remaining PCB soil concentrations will not result in future ground water concentrations in excess of the 0.5 $\mu g/l$ MCL ground water concentration for PCBs. The determination of a subsurface soil cleanup level other than 100 mg/kg PCB, will be in the sole discretion of the EPA.

Mill Street - Excavate all soils to a concentration of 1 mg/kg PCB or to a concentration at which leaching models and/or column testing show that infiltration through the remaining PCB soil concentrations will not result in future ground water concentrations in excess of the 0.5 $\mu g/l$ MCL ground water concentration for PCBs. The determination of a subsurface soil cleanup level other than 1 mg/kg PCB, will be in the sole discretion of the EPA.

The table below summarize the soil cleanup levels required to protect public health and the aquifer from the leaching of contamination into the groundwater and was developed specifically for the groundwater contaminant of concern, PCBs, which was detected above the Interim Cleanup Level for groundwater.

INTERIM SOIL CLEANUP LEVEL FOR THE PREVENTION OF LEACHING TO THE GROUNDWATER FOR THE PROTECTION OF HUMAN HEALTH

Carcinogenic Contaminant	Basis for Concern	Groundwater Risk	PCB Cleanup Level (mg/kg)
ELM STREET: PCB	Groundwater MCL of 0.5 ug/l	carcinogenic risk: 1.2×10^{-5} Hazard Quotient: 0.7	100
MILL STREET: PCB	Groundwater MCL of 0.5 ug/l	carcinogenic risk: 1.2×10^{-5} Hazard Quotient: 0.7	1

All of the cleanup levels for soils set forth in this ROD are consistent with ARARs for ground water, attain EPA's risk management goal for remedial actions, and have been determined by EPA to be protective of human health. These soil cleanup levels must be met at the completion of the remedial action at the points of compliance: throughout the Fletcher's Paint Site wherever soil contamination levels exceed the soil cleanup levels set in this ROD.

C. <u>Description of Remedial Components</u>

The preferred alternative includes excavation and treatment of the contaminated soils that present the highest risk to public health, excavation and treatment of the remaining contaminated soils to prevent the spread of the contamination into the groundwater, and natural attenuation and long-term monitoring of the contaminated groundwater. The preferred alternative remedial actions would be implemented using a phased approach that provides use of innovative technology, is cost-effective and reduces the potential impacts to the community.

Specifically the preferred alternative includes the following actions:

SOILS

Phase 1 - Mill Street Site Cleanup:

To address the current and future risks associated with dermal contact or ingestion of the contaminated surface and subsurface soils at the Mill Street Site, the activities would include:

- Excavation of approximately 1,500 yd^3 of surface soils (0 to 1 foot) at the Mill Street Site to a depth of 1 foot, wherever PCB concentrations are greater than 1 mg/kg PCB.

To address the future risks associated with ingestion of contaminated groundwater at the Mill Street Site as a result of leaching, the activities would include:

- Excavation of approximately 12,000 yd^3 of subsurface soils at the Mill Street Site (1 to 20 feet (bedrock) below surface), approximately 3,000 yd^3 of which are located below the water table, wherever PCB concentrations remain that exceed 1 mg/kg PCB; or excavation of soils to a PCB concentration at which leaching models and/or soil column testing show that infiltration through the remaining PCB soil concentrations will not result in future groundwater concentrations in excess of the 0.5 ug/l MCL groundwater concentration for PCBs. The determination of a subsurface soil cleanup level other than 1 mg/kg PCB, will be in the sole discretion of the EPA.

- Water collected from the dewatering of the excavated soils and water collected as a result of lowering of the water table to conduct the excavation, will be either treated on-site in a mobile unit and appropriately discharged to the Souhegan River or sent off-site to a treatment facility.

- Treatment of approximately 13,500 yd^3 of excavated soils by ex-situ thermal desorption. The thermal desorption unit would be located on the Elm Street property. This property is currently secured with a fence. Consideration may be given to the use of the former Fletcher's Paint Works building on the Elm Street Site as storage to stage and screen the contaminated soils prior to treatment. Liquid PCB condensate produced from the thermal desorption process will be disposed of off-site at an appropriate facility.

- Demolition and disposal of the Fletcher's Elm Street building prior to, or following thermal desorption activities. The manufacturing portion of this building was used to store paint pigments and chemicals. While these were removed in the 1993 removal action, gross contamination still exists in this facility and therefore some of the debris will have to be disposed of at an appropriate landfill facility. Consideration may be reviewed for use of these materials as fill material on the Site. Decontamination of building material, if warranted, and off-site disposal will be conducted in accordance with TSCA.

- Off-site disposal of all soil and debris that is either oversized or cannot be treated through the thermal desorption unit. All contaminated soil and debris will be disposed of in accordance with TSCA disposal regulations.

- Backfilling of the treated soils back onto the Mill Street Site and restoration of the property consistent with the anticipated future use of the Site. Specifically, the majority of the Mill Street Site will be paved, physically re-aligning Mill Street. The pavement will reduce infiltration of precipitation, control erosion and promote drainage away from the residential properties.

- Regrading and repair of the storm drainage ditch system, as necessary, to promote surface water flow away from the Site. Erosion control measures shall be incorporated into the final drainage system to prevent erosion or debris from restricting future storm water flow from the Mill Street Site or filling in of the drainage ditch.

Phase 2 - Elm Street Site Cleanup:

To address the current and future risks associated with dermal contact or ingestion of the contaminated surface and subsurface soils on the Elm Street Site, the activities would include:

- Excavation of approximately 2,800 yd^3 of surface soils at the Elm Street Site to a depth of 1 foot, wherever PCB concentrations are greater than 1 mg/kg PCB.

- Excavation of approximately 1,000 yd^3 of subsurface soils, within the utility corridor(s), at the Elm Street Site at depths between 1 and 10 feet, wherever PCB concentrations are greater than 25 mg/kg PCB. Final location of the utility corridor(s) within the Site will be determined during design.

- Excavation of approximately 11,600 yd3 of remaining subsurface soils, with the exception of the "hot spot" materials described below, from 1 foot to the seasonally low water table, wherever PCB concentrations remain that exceed 100 mg/kg; or to a PCB concentration at which leaching models and/or soil column testing show that infiltration through the remaining PCB soil concentrations will not result in future groundwater concentrations in excess of the 0.5 ug/l MCL groundwater concentration for PCBs. The determination of a subsurface soil cleanup level other than 1 mg/kg PCB, will be in the sole discretion of the

EPA.

- Excavation and off-site disposal in an appropriate landfill of the EB-03 "hot spot", a semi-solid stain (polyamide and polyurethane) material. This material is not amenable to the thermal desorption process, as the material is comprised of polyurethane, alkyd resins, etc., which may affect the performance of the thermal desorption unit. (The actual volume of this material is estimated to be 1,000 -2,000 yd3, and is considered part of the subsurface excavation volume describe above.)

- Removal and disposal of the 5 underground storage tanks located on the Fletcher's Elm Street property. (This could take also place during Phase 1, if appropriate)

- Treatment of the approximately 15,400 yd^3 of excavated soils by ex-situ thermal desorption. The thermal desorption unit would be preferably located on the Fletcher's Elm Street property. This may involve the placement of the mobile unit at one or more locations on the property during the excavation and treatment operations. Liquid PCB condensate produced from the thermal desorption process will be disposed of off-site at an appropriate facility.

- Backfilling of the treated soils on-site.

- Final grading of and placement of a 10 inch soil cover over the treated soils, or placement of treated soils within the top foot, which can demonstrate PCB concentrations less than or equal to 1 mg/kg PCB. Asphalt would be placed on areas designated for parking, consistent with the final grading plans and the future anticipated use of the Site. The asphalt covering will promote drainage and further minimize infiltration through the residual contamination at the Site. Restoration and landscaping of the remaining areas, not covered by asphalt. Erosion control measures will be incorporated into the final grading to prevent erosion of the cover materials off-site and into the Souhegan River.

- Institutional controls, in the form of deed restrictions would be implemented to prevent unauthorized access into the subsurface. Deed restrictions would also have to implemented to restrict future use of the Site, or the modification of the cover or surface drainage structures in ways inconsistent with this remedy or the anticipated future use of the Site.

GROUNDWATER

- Establish a Groundwater Management Zone (GMZ) under NH's Comprehensive Groundwater Policy. The GMZ sets plume boundaries within which groundwater will be monitored over time to ensure that the contaminant concentrations are decreasing; to ensure that the remaining contamination has not migrated beyond the established plume boundaries or impacted the Souhegan River; and that the covers are working and remaining effective over time. Institutional controls would have to be implemented to restrict the use of the groundwater within the GMZ while contaminant concentrations are in excess of drinking water standards. Further action may be necessary consistent with the NH Comprehensive Groundwater Policy.

- Interim Groundwater Cleanup Levels must be achieved within the GMZ and maintained for a period of three consecutive years. A risk assessment will be performed on residual groundwater contamination to determine protectiveness of the remedy. If EPA determined the remedy is not protective, the remedial action shall continue until protective levels are achieved and not exceeded for three years or until the remedy is deemed protective or is modified.

General Remedy Description

The selected remedy included thermal desorption for the treatment of the contaminated soils at the Site. Thermal desorption is an innovative technology that uses heat, at relatively low temperatures (600 to1000°F), to vaporize contaminants and consequently, separate those contaminants from the soil. Once vaporized, the contaminants are typically collected through condensation and concentrated condensate is then treated off-site at a TSCA approved incinerator. This alternative significantly reduces the volume of contaminants to be treated or disposed of, and allows the treated soil to be backfilled on to the Site.

Thermal desorption is a different process than incineration. Thermal desorption uses heat to physically separate the contaminants from the soil, which then requires further treatment. Incineration uses heat to actually destroy the contaminants.

Site Preparation. The Site preparation work for has four elements: (1) establishment of Site security, (2) provision for drainage, (3) clearing, and (4) development of a staging area. Depending on the schedule and space requirements needed for the remediation at Elm Street and Mill Street Sites, preparation for both sites may be completed simultaneously or one after the other. The decision would be made during the remedial design.

The chain link fence at Elm Street would be used to secure the processing area. Additional fencing may be required to complete the fence around the perimeter of the Elm Street and Mill Street Sites to restrict public access to the treatment facilities, contaminated soils, and areas of open excavation.

Site preparation work would include provisions for controlling site drainage to ensure proper drainage of storm water away from the Site. Erosion controls would be used to prevent uncontrolled movement of contaminated soils into uncontaminated areas during excavation activities.

Other site preparation activities include clearing and grubbing of trees and shrubs from the Elm Street Site along Keyes Drive and the Souhegan River and along the railroad tracks at the Mill Street Site, as necessary. Precautions would be taken during clearing and grubbing activities to limit exposure of the vegetation to soil contamination.

Three utility poles located on the Mill Street Site may require relocation to allow for soil excavation activities. The final clearing activities would involve the removal of the existing geotextile liners that currently exist at both the Elm and Mill Street Sites.

An area would be located outside of the 100-year floodplain to stage, as necessary, heavy equipment access roads, automobile and truck parking lots, material transfer stations, staging areas, decontamination areas, equipment sheds or trailers, storage tanks, worker sanitary facilities, and treatment systems.

The water collected during staging and de-watering of the soils excavated below the water table at the Mill Street Site would be processed in a water treatment system that would have to be installed to treat this and any other liquid effluent from dewatering operations required during excavation. Appropriate discharge of the treated effluent will be required. If this effluent is treated on-site, discharge could be to the Souhegan River or to an off-site treatment facility.

The Fletcher's Paint building would also be demolished and disposed of as part of the Site preparation, and could take place in either Phase 1 or 2 of the remedial action. In removing the building, care would have to be taken not to disturb the cemetery that is located on the east side of the building; coordination with appropriate officials will b e required to accommodate any concerns about Site work activities occurring in the buffer zone of the cemetery. The structure of the building is likely to have limited contamination and will be disposed of or decontaminated in accordance with TSCA. If any hazardous waste or asbestos is found, it will be disposed of appropriately. The foundation is expected to be contaminated, especially near the back (northern) area used for paint manufacturing, and may require off-site disposal in a TSCA chemical waste landfill, or RCRA Subtitle D landfill depending on the level of PCB contamination found, or the ability to decontaminate the materials on-site, consistent with TSCA. Consideration may be given to the use of the decontaminated demolition debris as backfill, in accordance with TSCA and all State and local regulations.

Excavation. The soils would be excavated in accordance with depth and cleanup levels set forth in the ROD. Shoring may be required along the excavation at Elm Street Site to allow continued use of Elm Street during Site operations. If necessary, traffic may have to be temporarily directed along one lane of Elm Street if shoring is not sufficient to ensure safe driving conditions until the excavation area adjacent to Elm Street could be backfilled. All efforts would be undertaken to limit any impact to the flow of the Elm Street traffic.

Excavation at the Mill Street Site would also require the cooperation of the railroad to ensure that excavation activities can be conducted while allowing continued operation of at least one railroad spur. Some of the highest levels of contamination at the Mill Street Site are present near and potentially under the railroad bed. Any excavation conducted will be managed to ensure that the structural integrity and safety of the railroad bed is not compromised.

Assuming an excavation rate of approximately 20 cubic yards of soil per hour, for 8 hour days, it would be expected to take approximately 20 weeks (770 hours) to excavate the 15,400 yd^3 of soil at Elm Street Site and approximately 17 weeks (675 hours) to excavate the 13,500 yd^3 of soil at the Mill Street Site. Wetting agents and engineered operating procedures will be used during excavation to minimize the generation of particulate emissions.

Excavation of the soil at a depth greater than 10 feet at the Elm Street Site may require the installation of vertical sheet pilings along the edge of the Souhegan River to act as a retaining wall. As the depth of excavation drops below the elevation of the river the sheet pilings would stabilize the river bank and reduce the infiltration of water from the river into the deep excavated areas. Installation of vertical sheet pilings at the Elm Street Site may be difficult due to the presence of debris-laden fill material, which was dumped along the river bank during the operation of the former burning dump as well as during development and construction of the Fletcher's facility.

At the Mill Street Site, the flow of groundwater will be minimized during excavation below the water table, through lowering the water table using de-watering well(s), or trenches, which would be designed and located during the remedial design. The extracted ground water would be treated separately or combined with the liquid effluent from the dewatered soils and processed through an on-site or off-site treatment system.

One concern regarding excavation at any depth is the volume of debris that was dumped at the Elm Street Site as backfill material over what was the old Town of Milford burning dump. Discussions with the Department of Public Works Superintendent for the Town of Milford indicated that fill material containing tree stumps, concrete blocks, large chunks of asphalt, and old tires was commonly mixed with fill material at the Elm Street Site. Drilling operations conducted on Site during the sampling phase reported the existence of tree stumps, concrete material, and thick rubber debris. Estimates of the debris volume of the soil requiring excavation range from 10 to 30 percent.

Soil, debris and liquids with PCB concentrations greater than 50 mg/kg, and which cannot be treated in the ex-situ thermal desorption or decontaminated on-site, would be transported to a TSCA-approved landfill. TSCA approved landfills that could potentially accept the soils in bulk form include, but are not limited to, the following:

- USPCI, Grassy Mountain, Tooele County, Utah
- Chemical Waste Management, Emelle, Alabama
- Chemical Waste Management, Model City, New York
- Envirosafe, Grand View, Idaho

Soil and debris with PCB concentrations less than 50 mg/kg, and which cannot be treated with ex-situ thermal desorption, would be transported over the highway to one of the RCRA Subtitle D landfills in the area. RCRA Subtitle D landfills in the region near the Fletcher's Paint Site that could potentially accept the soils include, but are not limited to, the following:

- Waste Management, Rochester, New Hampshire
- Laidlaw, Plainsville, Massachusetts
- BFI, East Bridgewater, Massachusetts

Thermal Desorption of Contaminated Soils. Thermal desorption is a process designed to remove organic compounds, including PCBs, from soils, sludges, and other media by vaporizing the contaminants from the soil into the carrier gas. The contaminants in the gas are then cooled through the use of condensers into a liquid form and then treated. The principal residuals from thermal desorption include the remediated soil, captured particulate, condensed liquid contaminants, and exhaust from propane heaters if used as the primary heating source. The remedy requires the off-site disposal of the liquid condensate in accordance with TSCA.

Pretreatment of the soil will be necessary before processing. After the excavation (or simultaneously along with excavation), the contaminated soil would be staged and dewatered, if necessary. The contaminated soils would be screened before desorption to enhance the efficiency of the desorber and protect the integrity of the desorber. After screening, the soil is conveyed into the thermal desorber for treatment. Oversized debris from the screening process will be disposed of in accordance with TSCA.

The treated soil would be discharged from the desorber, and quenched with water to cool the material and suppress fugitive dust emissions. Typical soil discharge temperatures are between 400°F and 500°F. Treated soils would be stockpiled until soil sampling ensured that soil cleanup levels were met.

After leaving the desorber, the carrier gas is passed through a cyclone separator where entrained particles are removed with a minimal drop in the off-gas temperature. The dry cyclone is followed by a wet scrubber, where the gas stream cooled to its saturation temperature. The scrubber removes a portion of the volatilized organics as the off-gas is cooled. Recirculated scrubber water continuously passes through a phase separator that collects any condensed light organics from the liquid surface and discharges a bottom sludge containing solids, water and organics. The scrubber sludge is sent to a filter press, the floating organics are drummed and sent off-site to a TSCA approved incinerator and the dewatered solids are reintroduced in to the thermal desorber feed stream. The aqueous phase from the filter press is also recirculated back to the phase separator.

The scrubbed gas passes to the first heat exchanger (condensor) where it is cooled to just above ambient temperatures. This heat exchanger would produce the bulk of the liquid condensate. The carrier gas proceeds through a second heat exchanger for further cooling. Liquid condensates from both heat exchangers are used as make up to the phase separator. The organic phase from the condensates are then separated from the water. The PCB contaminated condensor distillate is drummed and sent to an off-site TSCA incinerator.

The carrier gas would contain residual moisture and organics which were present in the feed. A mist eliminator traps any residual droplets entrained in the stream and the liquid is transferred to the condensate storage tank. The gas is heated to prevent condensate, and passed through a recirculation blower. After the blower, a small percentage of the carrier gas is vented and the remainder is heated before returning to the desorber. The process vent gas stream passes through a particulate filter and carbon adsorber before being released to the atmosphere. The spent carbon would be disposed of at an appropriate facility or regenerated. Propane fuel exhaust from the desorber burners can be vented directly to the atmosphere without treatment.

Site Restoration. Restoration activities will include backfilling the excavated pits with the treated soils, replacing, demolishing/disposing of any staging areas, compacting and grading the Site, reconstructing any existing roads, adding top soil, asphalt and hydro-seeding, as applicable. The final surface covering and grading of the Elm Street and Mill Street properties is flexible and can be altered in any way, consistent with the future anticipated uses of the Site.

The portion of the storm drainage line near the Mill Street Pond, which is aboveground will be repaired during Site restoration. Specifically, drainage controls will be installed to limit soil erosion along the ditch, while promoting drainage away from the Mill Street Site and the residential properties.

At Elm Street, the storm drainage system currently under the Fletcher's Paint Works building is not accessible by town personnel since the system lies, in some places, 17 feet below the surface. Since contaminated groundwater discharges through the drainage culvert during the seasonally high groundwater table, re-routing and actual placement of the new drainage system within a utility corridor will be necessary and actual location of the drainage system will have to be part of the remedial design. The original drain will be filled to prevent further flow through it, and into the Souhegan River.

Air Monitoring. During the excavation and treatment operations, air monitoring would be performed to ensure that nearby residents and on-site workers are protected. Air sampling stations would be located at representative points throughout the Site, along the perimeter of the

Site, and at sensitive receptors outside of perimeter of the Site. Samples would be analyzed at a minimum for VOCs and PCB-contaminated particulate.

Long-Term Monitoring Plan. The long-term monitoring plan would be designed to (1) monitor any changes in surface soil, sediment, ground water and surface water PCB concentrations; and (2) to ensure that the remedy remains protective of human health and the environment.

Sampling would be conducted during the remedial action until the Site soils have achieved the PCB cleanup levels. The soil cleanup levels are expected to be attained within 5 years after the start of the remedial action, therefore the monitoring would not be a long-term program. It would continue for approximately 10 years which should provide sufficient data to demonstrate the removal of all contamination, and sufficient to monitor the long-term protectiveness and permanence of the remedy. Because of the close proximity to the Souhegan River, surface water and sediment would be included in the long-term monitoring plan to evaluate the effectiveness of the cover to confirm that contaminants are not migrating into these media. EPA does not anticipate that any residual hazardous substance remaining in the soils at both Elm Street or Mill Street after the excavation, treatment, and capping will result in a future exceedance above Interim Cleanup Levels in the groundwater. This will be confirmed during the implementation of the long-term monitoring program.

Ground water monitoring would also be included in the long-term monitoring program to monitor the contaminant concentrations within the Groundwater Management Zone to ensure that the contaminant concentrations are decreasing, are not migrating beyond the boundary of the GMZ, and are not causing exceedances in the surface water. Groundwater monitoring will continue until Interim Cleanup Levels have been met and maintained throughout the GMZ for a period of 3 years.

Five-Year Reviews. Five-year reviews would be performed to evaluate whether the selected remedy remains protective of public health and the environment over time. Five year reviews are required whenever contamination is left in place at the Site at the completion of the remedial action. In this cleanup plan, contaminated soils with concentrations of 100 mg/kg PCB or less will be left in place at depths greater than 1 foot at the Elm Street Site, with the exception of the utility corridor. The five-year reviews would be initiated five years after the start of the remedial action and continue until contaminants no longer remain at the Site above levels that allow for unrestricted use and unlimited exposure. A review would also be conducted prior to remedial action completion and Site delisting.

Time to Complete Remedial Action.

Soils
The time required to complete the remedial action using excavation and thermal desorption would be approximately 2 years and 6 months if the operations were sequenced with phase 1 followed immediately by phase 2. The time required for each component of the remedial action is estimated as:

Site Preparation - 6 months
Construction/Startup - 3 months
Operation (Phase 1) - 8 months
Operation (Phase 2) - 10 months
Site Restoration - 3 months

Groundwater
Groundwater modeling predicted that with the source of the groundwater contamination addressed, would take approximately 25 years for the VOCs within the overburden to reach the Interim Cleanup Levels and approximately 100 years for the PCBs to reach the PCB Interim Cleanup Level in the overburden. While the full extent of contamination is unknown, it is expected that the bedrock contamination will take longer than the overburden to reach Interim Cleanup Levels. As part of the monitored natural attenuation of the groundwater, additional bedrock wells will be installed, and the extent of bedrock contamination will be evaluated to determine when and if the Interim Cleanup Levels will be attained.

Town Issues. The selected remedy requires that the contaminated surface and subsurface soils that present a risk to human health are excavated, and treated to levels that are permanently protective of the human health.

The phasing of the cleanup allows for a more efficient use of the Site properties, thereby reducing any potential use impact on the Keyes Field . While both portions of the Site are small in size, a thermal desorption unit can be placed on the Elm Street property during the cleanup of the Mill Street Site. If it becomes difficult to provide adequate space at the Site for remedial equipment, staging areas of clean fill, and other remedial activities, consideration will be give to the use of the Keyes Field with the Town's permission. The ability of the cleanup to be conducted, in preference, entirely on the Elm Street Site, will be thoroughly examined and detailed during the design.

Traffic on Mill Street may have to be temporarily rerouted during certain activities because of the small size of the Mill Street Site and the activities involved. However, previous removal efforts were undertaken with the closure of only one lane of the two lane road.

Future utilities and replacement of the storm drainage system would be performed during backfill operations. Access to these utilities would be accomplished through manholes, etc. which will be designed into the cover system. Deed restrictions would be implemented regarding access and use restrictions to the subsurface at the Elm Street Site.

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Fletcher's Paint Works and Storage Facility Superfund Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, attains ARARs, or invokes an appropriate waiver, and is cost effective. The selected remedy also satisfies the statutory preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element. Additionally, the selected remedy utilizes alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

A. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will permanently reduce the risks posed to human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through treatment, engineering controls, and institutional controls; more specifically this remedy will permanently reduce the risks presently posed by human health and the environment through:

- Excavation of soils to a depth of one foot at both the Elm and Mill Street Sites, and to a depth of 10 feet within the utility corridor at the Elm Street Site wherever contamination exceeds the soil cleanup levels set in this ROD.

- On-site treatment of these excavated soils by ex-situ thermal desorption.

- Off-site disposal of any soil, debris or liquid contaminated with PCBs above cleanup levels or is too large to be effectively treated by the thermal desorption system.

- Appropriate off-site disposal of the PCB-contaminated oil condensate.

- Long-term containment of the remaining contaminated soils present at depths greater than 1 foot and outside of the designated utility corridor (s) as follows:

    - excavation and treatment on-site in the thermal desorption system of the remaining soils exhibiting concentrations of PCBs greater than 100 mg/kg PCB at the Elm Street Site, and 1 mg/kg PCB at the Mill Street Site; or to a PCB concentration at which leaching models and/or soil column testing show that infiltration through the remaining PCB soil concentrations will not result in future groundwater concentrations in excess of the 0.5 ug/l MCL groundwater concentration for PCBs. The determination of a subsurface soil cleanup level other those set above for PCBs, will be in the sole discretion of the EPA.

- Backfilling of the treated soils on the Site, and restoration of the Site, including placement of soil and asphalt covers, consistent with the future uses of the Site.

- Natural attenuation and the long term monitoring of the contaminant concentrations in the groundwater to ensure that the Interim Cleanup Levels are met within the GMZ and that contamination is not migrating beyond the boundaries of the GMZ, or impacting the Souhegan River

- Institutional Controls to restrict the future uses of the properties, to prevent damage to the covers and access to the remaining contaminated soils, and restrictions on the use of the contaminated groundwater until the Interim Cleanup Levels are met and maintained.

The remedial actions, as proposed, will be protective of human health and the environment. Treatment of the soil contaminated to a depth of one foot at both the Elm and Mill Street Sites and to a depth of 10 feet within the utility corridor at the Elm Street Site, wherever contamination exceeds the soil cleanup levels set in this ROD, will eliminate current and future exposure risks from direct contact and incidental ingestion.

The selection of the long-term containment option of reducing all remaining PCB contamination at the Elm Street Site to 100 mg/kg PCB, and all remaining PCB contamination at the Mill Street Site to 1 mg/kg PCB - or to levels which would not cause an exceedance of the PCB MCL in groundwater in the future - provides the greatest protection of human health and the environment because it treats all the PCB contaminated soil that could potentially impact the groundwater under the Site in the future. The determination of a subsurface soil cleanup level other those set above for PCBs, will be in the sole discretion of the EPA. Institutional controls will be exercised, restricting the use of the groundwater, thereby eliminating the future ingestion exposure until natural attenuation processes can reduce the contaminant concentrations in the groundwater to safe levels. A long-term monitoring program will ensure the remedy remains protective of human health and the environment.

Implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts since the technology, while still innovative, has been successfully demonstrated at many Superfund Sites with PCB contamination, and pilot studies may be conducted at the Site before full scale operations begin. Phasing of the remedy allows the most use of the Site itself, thereby reducing public inconvenience. Finally, engineering controls and air monitoring will be employed and precautions taken to minimize potential air emissions at the Site during excavation activities.

Moreover, the selected remedy will achieve potential human health risk levels that attain the 10^{-4} to 10^{-6} incremental cancer risk range and a level protective of noncarcinogenic endpoints, and will comply with ARARs and To Be Considered criteria. At the time that the Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by ingestion of ground water. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until protective levels are achieved and have not been exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective or is modified. These protective residual levels shall constitute the final cleanup levels for this ROD and shall be considered performance standards for this remedial action.

B. The Selected Remedy Attains ARARs

This remedy (modified versions of SC-6 and MOM-2) will attain or waive all applicable or relevant and appropriate federal and state requirements that apply to the Site. A discussion of which requirements are applicable or relevant and appropriate may be found in the FS report for the source control and management of migration alternatives. A brief narrative summary of the ARARs follows. Refer to Tables 27 through 32 of this ROD for a comprehensive presentation of the ARARs and other policies, criteria and guidances to be considered (TBCs) that pertain to the selected remedy.

Chemical Specific ARARs

The Safe Drinking Water Act (SDWA) Maximum Contaminant levels (MCLs) and the State Ambient Groundwater Quality Standards (AGQSs), were used to determine appropriate Interim Cleanup levels for the groundwater and for the soils. The more stringent of these standards were used to establish groundwater and soil cleanup levels for the Site.

Location Specific ARARs

Excavations at the Site will not discharge excavated or fill materials into the Souhegan River or Mill Street Pond in accordance with the Clean Water Act, the NH Wetlands Act and the NH Dredging Rules. The remedy is the best practical alternative and all excavation will be undertaken with control of wetland excavation and with minimal impacts to the risk of flood loss in the floodplains, to the greatest extent possible. Restoration will be performed following any such excavation according to the Protection of Wetlands Executive Order No. 11990, the Protection of Floodplains Executive Order No. 11988 and the NH Wetlands Act.

Action Specific ARARs

Toxic Substances Control Act. Toxic Substances Control Act. The Toxic Substances Control Act (TSCA) 40 CFR Part 761, as amended, addresses the cleanup, storage and disposal of PCBs. The requirements of TSCA's Subpart D- Storage and Disposal Sections 761.60, 761.61, and 761.65, as amended, are applicable because the selected remedy involves the storage and disposal of soils and liquids contaminated with PCBs.

At both the Elm and Mill Street site, PCB-contaminated surface soils to a depth of 1 foot, will be treated on-site to a residual PCB concentration of less than or equal to 1 mg/kg and placed back in the excavated area.. At the Mill Street site PCB-contaminated subsurface soils will remain on-site at a concentration of less than or equal to 1 mg/kg and at Elm Street, PCB subsurface soils will remain on-site at concentrations of less than or equal to100 mg/kg, except within the utility corridor where the PCB concentration will be less than or equal to 25 mg/kg. The placement of soils with PCB concentrations of less than or equal to 1 mg/kg and less than or equal to 100 mg/kg under an asphalt and 10-inch soil cover, at Elm Street and Mill Street respectively, would provide a permanent and protective remedy that satisfies the requirements of the §761.61(c).

Storage

While waiting to be treated, PCB remediation waste may be stored in accordance with §761.65. §761.65(c)(9) permits bulk PCB remediation waste to be stored at the cleanup site for 180 days, subject to the following conditions:

- The waste is placed in a pile designed and operated to control dispersal of the waste by wind, or where necessary, by means other than wetting.
- The waste must not generate leachate through decomposition or other reactions;
- The storage site must have a liner designed to comply with the requirements of Section 761.65(c)(9)(iii).

Liquid PCBs produced from the thermal desorption treatment, in accordance with §761.65(c)(1), are required to be stored for no more than 30 days. Pursuant to §761.61(c), however, the Regional Administrator has determined that liquid PCB remediation waste may be stored for a longer period of time than prescribed in §761.65(c)(1). This determination was based on technical, environmental, and/or waste specific characteristics or considerations, that the proposed storage methods will not pose an unreasonable risk of injury to health or the environment.

Disposal

Section 761.61(a)(5)(i)(B)(2)(ii) provides that soil or debris contaminated with PCBs at concentrations of less than 50 mg/kg shall be disposed of in accordance with §761.61(a)(5)(v)(A), which provides the following disposal options:

- a municipal solid waste landfill permitted under Part 258;
- a non-municipal, non-hazardous landfill permitted under §§257.5 through 257.30;
- RCRA Subtitle C landfill permitted to accept PCB waste; or
- a TSCA approved PCB disposal facility.

Soils or debris contaminated with PCBs at concentrations of greater than or equal to 50 mg/kg will be disposed of:

- in a hazardous waste landfill approved under §3004 of RCRA;
- in an incinerator approved under §761.70;
- by an alternative disposal method approved under §761.60(e); or
- in a chemical waste landfill approved under §761.75

Liquid PCB remediation waste will either be decontaminated to the levels specified in §761.79(b)(1) or (b)(2) or be disposed of in accordance with §761.60(a), §761.60(e), or §761.61(c).

Resource Conservation and Recovery Act (RCRA) and the NH Hazardous Waste Management Act and Hazardous Waste Rules. State (and federal as incorporated by the state) hazardous waste regulation are applicable to actions occurring on-site which generate hazardous waste. Undisturbed waste left in place, although not characterized, is determined to be similar to RCRA waste; therefore certain state and federal hazardous waste regulations are relevant and appropriate for actions taken on-site to address these wastes. RCRA Land Disposal Regulations are neither applicable nor relevant and appropriate since all movement of contaminated soils occur on-site within an area of contamination, and placement does not occur.

Hazardous waste generated and stockpiled onsite for longer than 90 days through excavation, demolition or treatment will be stored in waste piles or in tanks in accordance with 40 CFR 262.34 and 40 CFR 264 Subparts J and L before final disposal. Certain closure requirements are relevant and appropriate for the Site such as groundwater monitoring and long-term monitoring and maintenance plans. Cover requirements are also relevant and appropriate; however as explained below, EPA is invoking the equivalency waiver for cover requirements under CERCLA 121(d)(40(D). In addition, certain portions of the State hazardous waste facility siting requirements are waived pursuant to Env-Ws 353.10 as explained below.

Air Regulations. The design and operation of the thermal desorption treatment system will meet the air pollutant emission standards and monitoring requirements under the respective Subparts P, AA, and CC of RCRA, and the NH Administrative Code, Air Chapter 100, Parts 604-606, Env-Wm 702.11 and 702.12 as well as the NH Env-A 1002 and 1305.

Dust and asbestos m the Site during demolition and excavation would need to comply with the Clean Air Act and the State of New Hampshire Air Regulations for emissions during demolition, excavation and transportation of the contaminated soils. Engineering controls would be used to minimize the fugitive dust emissions, including wetting the soils and using foams, as necessary.

While each thermal treatment unit varies, contaminants present in the carrier gas is assumed to be negligible due to the pollution control devises on the unit such as condensers, filters and the use of activated carbon. Propane fuel, if used, should burn cleanly in the desorber and the exhaust could be vented directly to the atmosphere. Air monitoring of the thermal treatment unit would be performed to ensure compliance with the NH Air Regulations.

Water Regulations. The monitored natural attenuation of the groundwater will comply with the Clean Water Act and the Safe Drinking Water Act which establish Ambient Water Quality Criteria (AWQCs)for surface waters and MCLs for drinking waters. The groundwater at the Site will be monitored to ensure that the MCLs, which are relevant and appropriate for groundwater, are attained in the future and that the Souhegan River Surface waters are not impacted by the contaminated groundwater and comply with the AWQCs.

Waivers

Storage Requirements

Any hazardous waste and PCB contaminated materials generated during the RI/FS has required storage and may continue to require storage until the start of the remedial action, exceeding regulatory storage limitations under TSCA and the State Hazardous Waste Regulations. The final disposition of these wastes comply with ARARs, as the investigative derived wastes currently stored on the Site will be treated via thermal desorption, consistent with the selected remedy. An interim remedy waiver pursuant to CERCLA § 121(d)(4)(A)is being invoked for the RCRA and TSCA Storage limitations for RI/FS generated wastes since the wastes currently stored on the Site is interim in nature and the final remedy will comply with all ARARs for final disposition of the waste.

NH Hazardous Waste Treatment Facility Siting Requirements
The siting requirements for new facilities for hazardous waste treatment under the New Hampshire Hazardous Waste Regulations are applicable for the selected remedy, which includes the on-site treatment of contaminated soil and groundwater (from the de-watering operation). The Env-Wm 353.09 siting regulations specify various siting requirements that must be complied with or waived under Env-Ws 353.10.

During implementation of the remedy, the siting of the thermal desorption system would likely be on the Elm Street Site and the de-watering groundwater treatment system would likely be on the Mill Street property.

A waiver is invoked for certain portions of the siting requirements for new facilities due to the on-site treatment required as part of the selected remedy. Under the provisions of Env-Ws 353.10, these requirements can be waived if it can be demonstrated clearly and convincingly that the facility will not pose an unreasonable risk to public health or the environment. The Administrative Record for this Site demonstrate that the engineering safeguards of the facility will be designed to ensure normal operation, prevent public health threatening accidents, and mitigate hazardous waste discharges to the environment. Specifically waivers are being invoked for the siting requirements 353.09 (b) (2) location within a 100-year flood plain and 353.09(d), location within the specified distance to a residence, school, home for the elderly, adjacent property line, surface water public intake system, edge of river, within a non-bedrock aquifer with greater than 200,000 g.p.d yield and within a class A rivershed. (See Figure 16 for Floodplain boundaries).

A waiver of the closure requirements of Env-Wm708.02 is invoked pursuant to CERCLA § 121(d)(4)(D) on the grounds that the cover systems of the selected remedy attain an equivalent performance standard as required by State regulations. At Mill Street, soil will be cleaned up to 1 mg/kg PCB and an asphalt cover applied over the backfilled, treated soil. At the Elm Street Site soil will be cleaned up to 100 mg/kg PCB and the cover material is a combination of soil and asphalt, thus eliminating risks from exposure to the subsurface soils from dermal contact and incidental ingestion. The soil and asphalt cover meet the performance requirements of the NH Closure regulations. Specifically, the soil and asphalt cover will be designed to promote drainage, thus minimizing the infiltration of the precipitation and the generation of leachate. The placement of the asphalt over the majority of the Elm and Mill Street Site meets the requirement that the cover material be less permeable than the bottom material, which for this Site is natural soil materials with very high permeabilities. The asphalt cover will also be designed to control and direct run-off from the Site as well as prevent erosion of the cover materials off of the Site and into the surrounding properties or into the Souhegan River. The cover materials will be maintained in such a way as to ensure that these performance standards will be met at the Site.

To be Considered

The following policies, criteria, and guidances will also be considered (TBCs) during the implementation of the source control and management of migration remedial actions:

- Toxic Substance Control Act (TSCA), PCB Spill Cleanup Policy;
- EPA Guidance on Remedial Actions for Superfund Sites with PCB Contamination;
- EPA Groundwater Protection Strategy
- EPA Guidance on Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Groundwater at CERCLA Sites;
- EPA Policy Directive for the Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites;

C. The Selected Remedial Action is Cost-Effective

In the Agency's judgment, the selected remedy is cost effective, i.e., the remedy affords overall effectiveness proportional to its costs. In selecting this remedy, once EPA identified alternatives that are protective of human health and the environment and that attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria--long term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short term effectiveness, in combination. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs.

The costs of this remedial alternative are:

	Source Control SC-6: Thermal Desorption	Management of Migration MOM-2: Monitored Natural Attenuation/Institutional Controls	Total Costs
Capital Cost	$ 11,791,615	$0	$11,791, 615
O&M Cost	$ 39,000	$198,380	$ 237,380

Present Worth Cost	$12,292,375	$2,439,600	$14,731, 975

The costs of this remedial alternative are presented in Appendix F. A comparison of costs associated with the FS alternatives were presented in this ROD in Tables 25 and 26.

With the exception of the no action and limited action alternatives, all of the source control alternatives, SC-4 through SC-8, are protective of human health and the environment and attain ARARs. Comparing these alternatives, EPA's selected remedy combines the most cost effective remedial components evaluated, and makes changes to reflect the anticipated future uses of the Site and public comment. Specifically, the selected remedy is less expensive than the treatment alternatives presented in the FS as a result of changes in the subsurface soil cleanup levels, and long-term management actions. The selected remedy is cost effective in that these changes actually make the Site more protective for less costs. In addition, a smaller volume of soil would also be excavated, while providing a higher level of long-term permanence and protection at the Site since the concentrations of the soils remaining at the Site are protective of groundwater from leaching with only a soil cover. While the selected remedy would cost approximately $3 to 4 million more than a full containment remedy (SC-3), a full containment was not supported by the public, the Town or the State. The selected remedy, while more costly, provides for the complete removal of soil contamination for the protection of both human health from direct contact, incidental ingestion and leaching of the soils into the groundwater in excess of the PCB MCL for groundwater, requiring only future long-term monitoring of the contaminated groundwater and institutional controls on the future use and access to the Site and use of the groundwater as a drinking water supply. A full containment remedy would require the installation and operation of a pump and treat hydraulic control system at the Mill Street Site which would be anticipated to be operated for over 100 years, due to the high levels of contamination at the Site, and the slow transport of that migration over time into the groundwater.

Because the source control action requires that all soils are to be cleaned up such that they are protective of the groundwater in the future with only a soil cover, the limited action alternative, MOM-2 becomes the most cost-effective management of migration alternative. Active management of migration through pump and treat (MOM-3,4,5 and 6) would not offer significant savings on the time required to meet the cleanup levels since the effectiveness of groundwater extraction for TCB and PCBs is limited. The majority of the pump and treat alternatives cost up to $1.5 million more than monitored natural attenuation, while offering no increase to the level of protectiveness.

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

With the exception of alterative SC-1, SC-2 and MOM-1, all the alternatives were determined to be protective of public health and the environment and would attain (or waive) ARARs. Source control alternatives SC-3 - SC-8 and management of migration alternatives MOM-2 - MOM-6 were compared using the five balancing criteria above. In general, the combination of alternatives SC-6 and MOM-2 best satisfy these criteria and in combination, were chosen as the recommended remedy. There is no direct opposition to the use of thermal desorption at the site, other than PRP and public interest in EPA reviewing the potential use of an innovative form of thermal desorption, which is performed by heating wells, in-situ. Based on the data available to date, EPA was not able to fully evaluate this technology for comparison to the ex-situ thermal desorption technology selected in the remedy. The selected remedy provides a higher degree of long-term effectiveness and permanence by excavating and treating all soils that could pose a long-term threat to human health and the groundwater when compared to the containment alternative SC-3 which would leave high levels of contamination in place at the Site. Thermal desorption would similarly reduce toxicity, mobility and volume through treatment as would SC-8, solvent extraction; but would have less short-term impacts and implementability issues. Off-Site disposal (SC-4), and solvent extraction (SC-8) had comparable costs to thermal desorption. SC-6, thermal desorption was more expensive than both containment (SC-3) and solidification/ stabilization (SC-7); and less expensive than off-site incineration (SC-5).

Monitored natural attenuation, MOM-2, does not use treatment to reduce toxicity, volume or mobility of the contamination in the groundwater, as would MOM-3 through MOM-6. However, in combination with the source control actions, the groundwater will attain Interim Cleanup Levels through natural processes in a reasonable time frame, when compared to active pump and treat it is unclear how effective pump and treat would be for the attainment of the PCB and TCB cleanup levels given their slow transport through the subsurface. MOM-2 costs less than MOM-3 through MOM-6 while offering a similar level of protectiveness.

E. The Selected Remedy Satisfies the Preference for Treatment Which Permanently and Significantly reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The principal element of the selected remedy is the source control action which utilizes excavation and treatment of the contaminated soils using ex-situ thermal desorption. Thermal desorption will remove and concentrate the contaminants in the soil, thereby permanently reducing the volume of and mobility of the contaminants on the soil. The condensate will be transported off-site to an approved TSCA incinerator for treatment, thereby permanently reducing the toxicity of the contaminants at the Site.

The source control action addresses the primary threat at the Site, the contamination of the surface and subsurface soils. Treatment of the subsurface soils also permanently removes contaminants that pose a long-term threat to the groundwater. The selected remedy satisfies the statutory preference for treatment as a principal element by excavating, treating on-site with ex-situ thermal desorption and sending the condensate off-site for incineration.

Treatment of the contaminated groundwater is not part of the selected remedy, however natural attenuation processes will eventually result in the attainment of the Interim Cleanup Levels in the overburden in 20-25 years for VOCs and 100 years for PCBs. Natural Attenuation processes may result in the attainment of the Interim Cleanup Levels in the bedrock depending upon the full extent of the contamination within the bedrock. The groundwater monitoring program will assess the potential for DNAPL within the bedrock system. If DNAPL is conclusively found or concluded to be within the bedrock aquifer, a Technical Impracticality waiver may be sought for the PCB MCL within the bedrock if the waiver standards are demonstrated.

Although the management of migration portion of the remedy relies on natural attenuation to achieve groundwater cleanup standards, the overall remedy is effective only through the active treatment of the soils at the Site.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

EPA issued a Proposed Plan for remediation of the Site in December 1996 and presented it to the public at a meeting held on January 14, 1997. EPA proposed a cleanup plan that would treat the soils that presented the highest risks to public health and treat the highly contaminated soils within the subsurface at both Elm Street and Mill Street that posed the greatest threat to groundwater in the future. The large volume of remaining, lesser contaminated soils would covered with a cap to prevent the spread of the contamination into the groundwater and the groundwater would be restricted from use, and monitored until natural processes reduced contamination levels in the groundwater to acceptable levels.

In the Proposed Plan, the main components of the source control portion of the preferred alternative incorporated a phased approach which included:

Phase 1 - Mill Street Site:

- the excavation and on-Site treatment using thermal desorption, of all contaminated soils in the top 0 to 1 foot at the Mill Street Site;

- the excavation and on-Site treatment using thermal desorption of all contaminated soils in the subsurface (from 1 foot to bedrock), wherever concentrations were greater than 1 mg/kg PCB, or to a level which, in the future, would not result in exceedances above the interim cleanup levels in the groundwater. Placement of the treated soils on the Site, and restoration consistent with the expected future use of the property.

Phase 2 - Elm Street Site:

- the excavation and on-Site treatment using thermal desorption, of all contaminated soils in the top 0 to 1 foot at the Elm Street Site;

- the excavation and on-Site treatment using thermal desorption of all contaminated soils at the Elm Street Site in the subsurface from 1 to 10 feet where PCBs were greater than 10 mg/kg;

- the excavation of all soils at Elm Street, below 10 feet, with PCB concentrations greater than 500 mg/kg;

- the placement of a single-liner cap (RCRA Subtitle D) over the remaining contaminated soils at the Elm Street Site to prevent the infiltration of precipitation. Placement of the treated soils on the Site, and restoration consistent with the expected future use of the property

The management of migration portion of the preferred alternative included use of natural attenuation processes and long-term monitoring to attain the interim cleanup levels in the future. Institutional controls were also included to restrict access to groundwater, thereby preventing ingestion of the contaminated groundwater, until drinking water standards could be met.

The soil cleanup levels and depths in the Proposed Plan were set as a result of exposure assessments relating to discussions with the Town of Milford regarding the anticipated future uses of the properties. Specifically, the Town of Milford anticipated that the Town would take over both the Elm Street and Mill Street properties. The Elm Street Site would become an extension to the Keyes Field, primarily for extended parking purposes. In addition, the Town wanted future accessibility to the subsurface for routine maintenance and repair to the drainage system and for possible unforseen activities associated with the Keyes Field such as the placement of utilities associated restrooms, a concession stand, and parking light installation. It was anticipated that the entire Site would not be covered in asphalt for parking due to the steep slope presented at the Site, but that parking would be the primary purpose of the future use of the Elm Street property. The Mill Street Site would be used to physically move Mill Street from its current position, further north, thereby giving additional buffer between the Mill Street residences and the road. No future use was anticipated for the subsurface at the Mill Street Site. The excavation required under EPA's 1996 Proposed Plan, totaled approximately 33,300 cubic yards of contaminated soil and was estimated to cost $17.9 million.

EPA accepted comment on the Proposed Plan from January 15, 1997 through April 21, 1997. EPA received a letter from the Town of Milford requesting EPA to accept changes in the anticipated future use of the Elm Street Site, thereby also changing the scope of the final remedy. Specifically the Town of Milford requested that EPA consider incorporating a utility corridor(s) scenario within the Elm Street Site, where any and all future maintenance of any utility and culvert system could be accomplished. By restricting the future subsurface exposure pathways to a utility corridor(s) and placing restrictions on access and use of the remainder of the subsurface at the Elm Street Site, future human health exposure to the subsurface soils, re-deposited onto the surface through excavation would be eliminated. The surface of the Site would remain consistent with the prior anticipated future use as primarily a parking area extension to the Keyes Field. The Town noted that these recommended changes could result in a decrease in the volume of soil that required excavation and treatment, thereby reducing costs and short term impacts related to implementing the proposed plan alternative.

As a result of public comment on the EPA's 1996 Proposed Plan, EPA delayed the issuance of the Record of Decision until changes could be made with respect to the future uses of the Site, and to accept and review data on an innovative technology proposed for review called In-Situ Thermal Desorption ("ISTD - Thermal Wells"). This technology is being developed by Terratherm, a subsidiary of Shell Oil. GE has proposed the ISTD - Thermal Wells as an alternative technology to the ex-situ thermal desorption technology.

EPA held numerous meetings to discuss the Towns comments and how the FS alternatives could be adapted to consider the new future use changes requested by the Town. In addition, EPA reviewed data from pilot studies where the ISTD-Thermal Well technology has been demonstrated. GE also submitted a Focused Feasibility Study in December of 1997, which developed FS alternatives that included a mixtures of the use of the ISTD - Thermal Well technology and the use of containment with hydraulic control to reach the cleanup goals for the Site.

Significant changes to the scope of the remedy were made and incorporated into this Record of Decision as a result of public comment and the review of subsequent materials in the time period between public comment and the issuance of the Record of Decision. The significant changes made from the Proposed Plan to this Record of Decision include the following:

- **Subsurface Soil Cleanup Levels**:

Under an unrestricted recreational use of the Site, adults and children could be subject to unacceptable risks from exposure to subsurface soils brought to the surface by future excavations. The Town of Milford has indicated that future excavation of the Elm Street Site would be restricted to defined utility corridor(s). This will prevent exposures to the adult and child recreational user to contaminated subsurface soils. The 10 foot depth corresponds to a depth which is considered accessible in the performance of utility placement and maintenance. The cleanup level for subsurface soil within the utility corridor(s) at the Elm Street Site, is 25 mg/kg PCB, and is derived from EPA's Guidance on Remedial Actions for Superfund Sites with PCB Contamination (EPA, 1990) (TSCA PCB Spill Policy). The cancer risk for a utility worker who might be exposed to 25 mg/kg PCB in the utility corridor(s) on an infrequent basis is 4.6×10^{-7}. For non-carcinogenic risks, the Hazard Quotient at 25 mg/kg PCB for the utility worker, is 0.3. (See Appendix E of this ROD for the calculations of the utility worker cancer and Hazard Quotient).

No subsurface future uses are expected for the Fletcher's Mill Street property and therefore no exposures were evaluated. However, the Draper Energy Coal Yard portion of the Mill Street Site has anticipated future uses as a commercial property. Because no future access restrictions will be placed on the subsurface soils at the Draper energy portion of the Mill Street Site, these subsurface soils will be cleaned to 1 mg/kg PCB, consistent with the surface soil exposure criteria for the Site. The 1 mg/kg PCB cleanup standard is also consistent with the Mill Street subsurface soil cleanup standard for the protection of groundwater through the leaching of contamination to the groundwater.

- **Change to the Elm Street Long-term Management of residuals:**

Soils not addressed above include those below 1 foot at the Elm Street Site, with the exception of the area to be designated as the utility corridor. These soils are not expected to pose a threat to human health through direct contact given their depth or location, based on anticipated future uses of the property; however, contaminants at these depths could leach into the ground water and pose a threat to human health through ingestion of ground water. The remedial action objective for these soils is to prevent the leaching of contaminants from the soil to the ground water that will result in the concentration of PCBs in the ground water in excess of health and risk-based ARARs.

As a result of the PCB migration analysis, long-term management controls for the PCB contaminated soils were developed to prevent the leaching of the contaminants from the soils in the ground water in exceedance of the MCL for PCBs. *The Guidance for Remedial Actions for Superfund Sites with PCB Contamination* [EPA, 1990] was considered in addressing the contaminated soils that may be contained and managed in place over the long term through appropriate engineering and institutional controls. The long-term management controls developed for the Elm Street Site was presented in Source Control Alternative 4.

The 1996 Proposed Plan addressed the these Site soils by requiring excavation wherever concentrations were greater than 500 mg/kg PCB. This required an excavation of an additional 1,600 cubic yards of soils in addition to the excavation of 18,200 cubic yards of soils associated with the human health based cleanup levels in the top ten feet of the Site, for a total of 19,800 cubic yards of contaminated soils requiring excavation.

Consistent with the EPA guidance and the TSCA long-term management controls, Sites where concentrations of PCBs remaining are 500 mg/kg or less, a single, flexible membrane liner (FML) cap consistent with RCRA Subtitle D would be required to prevent the infiltration of precipitation and the leaching of the PCBs into the groundwater above drinking water standards. Long-term monitoring would also be required to assure that the cap remains protective of the groundwater This cap would also require continuous maintenance and restrictions would have required to prevent access to and potential damage to the cap.

The final remedial action plan requires that all soils at the Elm Street Site, below 1 foot with the exception of those within the utility corridor, be excavated wherever concentrations exceed 100 mg/kg PCB or to a PCB concentration at which leaching models and/or soil column testing show that infiltration through the remaining PCB soil concentrations will not result in future groundwater concentrations in excess of the 0.5 ug/l MCL groundwater concentration for PCBs. The determination of a subsurface soil cleanup level other than 100 mg/kg PCB, will be in the sole discretion of the EPA. The remaining soils are protective of groundwater, but not protective of a child or adult trespasser on the Site; therefore while institutional controls will restrict future access into these soils, a 10-inch soil cover and asphalt are required to maintain a protective layer from the contaminated soils and areas of unrestricted access. Maintenance of the soil and asphalt cover would be conducted consistent with TSCA and State regulations. This long-term management action of a soil and asphalt cover is consistent with the TSCA long-term management controls where PCBs are left in place at the end of a remedial action that are greater than 25 mg/kg PCB but less than or equal to 100 mg/kg, if the Site is covered with a cap meeting the requirements of 761.61 (a)7 and (a)(8). The cover also meets the performance standards of the State closure regulations.

The amount of contaminated soil estimated to have concentrations greater than 100 mg/kg PCB, and thus requiring excavation as apart of the selected remedy is 11,600 cubic yards. The total excavation for the Elm Street Site in the final selected remedy is 15,400 cubic yards, 4,400 cubic yards less than that estimated for the Proposed Plan.

❑ **Change in the amount of soil requiring excavation:** Under the new cleanup scenario, the volume of soils estimated to require excavation were reduced from the 1996 Proposed Plan estimate of 33,300 cubic yards to the following:

<u>Elm Street Site:</u>

Area	Cleanup Level	Soil Volume
0-1 foot:	1 mg/kg PCB	2,800 cubic yards
Utility Corridor, 1-10 feet:	25 mg/kg PCB	1,000 cubic yards
1-23 feet:	100 mg/kg PCB	11,600 cubic yards
	Total:	15,400 cubic yards

<u>Mill Street:</u>

Area	Cleanup Level	Soil Volume
0-1 foot:	1 mg/kg PCB	1,500 cubic yards
1- bedrock:	1 mg/kg PCB	12,000 cubic yards
	Total:	13,500 cubic yards

The total excavation for this ROD includes 28,900 cubic yards of soil.

❑ **Reduction of Costs**:
The estimated costs for the 1996 Proposed Plan were $17.9 million. Due to the time lapse from the generation of the FS alternative cost estimates and the Proposed Plan cost estimate, which were developed using 1995 quotes, new estimates were developed to reflect the costs associated with the Proposed Plan using 1997 quotes. The 1997 quotes for treatment using thermal desorption indicated that the most conservative cost for treatment was $200 per ton. This estimate was less than the 1995 most conservative quote of $250 per ton treated. The associated cost savings of $50 per ton, reduced the Proposed Plan costs by approximately $1.8 million, to a new 1997 cost estimate of $16.1 million ($13.8 million for the source control and

$2.4 million for the monitored natural attenuation).

In addition, to reflect the changes accepted to the future use of the Elm Street Site, described above, EPA also developed 1997 cost estimates for the Thermal Desorption alternative. While new 1997 cost estimates were not developed for all of the FS alternatives, it should be noted that similar cost savings for alternatives SC-4 through SC-8 would be recognized as a result of the changes in the future land use assumptions. Since there would be no changes in the SC-1, SC-2 or SC-3 alternatives as a result of having no impact from the change in the future use for the Elm Street Site, no 1997 cost estimates were developed, and therefore the 1996 costs estimates as presented in this ROD remain accurate. This information was presented to both GE and the Town of Milford in a letter dated March 6, 1998.

The estimated total volume of soil in the selected remedy, requiring excavation and treatment using thermal desorption is 28,900 cubic yards. Using the most conservative 1997 cost estimates for thermal desorption, the final selected remedy has a cost estimate of **<u>$14.7 million</u>** ($12.3 million for the source control and $2.4 million for the monitored natural attenuation). This represents a $1.4 million decrease in costs from the 1997 Proposed Plan costs and a $3.2 million decrease from the 1996 Proposed Plan cost estimate.

Additional Potential for Cost Savings:

Additional costs savings can be reviewed at EPA's discretion, during implementation of the selected remedy. These additional costs savings may include all or some of the following:

1) Cost savings could be seen during implementation of the final selected remedy as a result of lower actual per unit ton treatment costs of thermal desorption treatment. While the most conservative 1997 quote of $200 per ton was used to develop the costs associated with the final selected remedy, less conservative costs may be realized during implementation of the remedy. The costs for thermal desorption are becoming more competitive as the technology sees more vendors available and gains more widespread use and acceptance. Costs of $100 per ton are not unreasonable for some Sites.

If the costs for the treatment of thermal desorption were estimated to be $100 per ton, the cost savings of the selected remedy would be approximately 2.7 million dollars. This would result in a final cost for the remedy of $ 11.4 million ($9.6 million for source control and $2.4 million for monitored natural attenuation).

2) Leaching modeling and/or soil column testing may be conducted during design to determine a site specific PCB concentration that could remain in the subsurface and not result in a future exceedance of the 0.5 ug/l PCB MCL in groundwater. While these studies may or may not be

undertaken during design, any increase in the PCB soil cleanup from the 1 mg/kg PCB concentration used in the cost estimate would realize a cost savings, if EPA determines that the PCB concentration would be protective of the groundwater in the future. The cost saving would be realized in the decrease in the volume of soil requiring excavation and treatment. For example, if EPA determined that an increase to 100 mg/kg PCB would be protective of the groundwater at the Mill Street Site, this would result in 7,600 cubic yards less soil requiring excavation and treatment at an additional cost savings of approximately $ 2.6 million. This could result in a cost reduction to $12.1 million for the remedy ($9.7 million for the source control and $2.4 million for the monitored natural attenuation).

If both cost saving scenarios described above are realized for the final remedy, a total cost savings of approximately $ 4.5 million could be realized, for a potential cost estimate of $10.2 million. ($7.8 million for the source control and $2.4 million for the monitored natural attenuation).

The costs associated with this Record of Decision are $1.4 million less than the 1997 Proposed Plan costs.

XIII. STATE ROLE

The New Hampshire Department of Environmental Services has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, the Baseline Human Health Risk Assessment and its amendments, the Preliminary Ecological Risk Assessment and the Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State Environmental laws and regulations. The State of New Hampshire has not concurred with the selected remedy for the Fletcher's Paint Works and Storage Facility Superfund Site as of the signing of this ROD. EPA anticipates that the State will concur shortly. A copy of the declaration of concurrence will be attached as Appendix A upon receipt.